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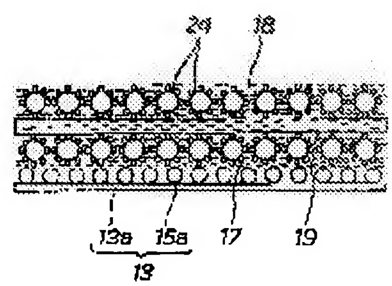
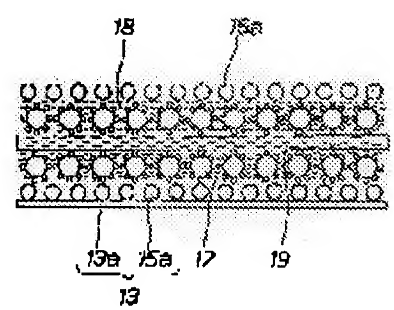
(54) MANUFACTURING METHOD OF FUEL CELL ELECTRODE STRUCTURE

(a)



(b)



(57)Abstract:

PROBLEM TO BE SOLVED: To provide a manufacturing method of a fuel cell electrode structure in which occurrence of adhesion defective parts at the border of each layer can be prevented and performance degradation of the ion exchange membrane can be prevented, and in addition, the ion exchange membrane can be made thin.

SOLUTION: The manufacturing method of the fuel cell electrode structure comprises a process in which a solution of a negative electrode layer 17 is applied on the negative electrode side diffusion layer 13 and the negative electrode layer is formed, a process in which a solution of an ion exchange membrane 19 is applied on the negative electrode layer while the negative electrode layer is not dried up yet and the ion exchange membrane is formed, a process in which a

solution of a positive electrode layer 18 is applied on the ion exchange membrane while the ion exchange membrane is not dried up yet, and a process in which, by drying these negative electrode layer 17, positive electrode layer 18, and ion exchange membrane 19, the negative electrode layer 17, the positive electrode layer 18, and the ion exchange membrane 19 are solidified integrally.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]In this invention, an ion-exchange membrane is arranged between right and a negative electrode, and while contacting hydrogen for the catalyst of a negative electrode, oxygen is contacted for the catalyst of an anode.
Therefore, it is related with the manufacturing method of the electrode structure for fuel cells to generate.

[0002]
[Description of the Prior Art]Drawing 8 is an explanatory view explaining the conventional fuel cell. While contacting a hydrogen content child (H_2) for the catalyst which the fuel cell 100 arranges the ion-exchange membrane 103 between the negative electrode layer (hydrogen pole) 101 and the positive electrode layer (oxygen pole) 102, and is included in the negative electrode layer 101, By contacting an oxygen molecule (O_2) for the catalyst included in the positive electrode layer 102, current is generated by passing electronic e^- like an arrow. When generating current, produced water (H_2O) is generated from a hydrogen content child (H_2) and an oxygen molecule (O_2). The following figure explains in detail the electrode structure which uses the negative electrode layer 101 of this fuel cell 10, the positive electrode layer 102, and the ion-exchange membrane 103 as a main component.
[0003]Drawing 9 is an explanatory view showing the electrode structure which constitutes the conventional fuel cell. Electrode structure has the binder layer 106 and the binder layer 107 inside the diffusion zone 104,105 of a couple, respectively, It has the negative electrode layer 101 and the positive electrode layer 102 inside these binder layers 106 and the binder layer 107, respectively, and has the ion-exchange membrane 103 between these negative electrode

layers 101 and the positive electrode layer 102.
[0004]When manufacturing this electrode structure, while applying the solution for binder layer 106 to the diffusion zone 104 first, the binder layer 106,107 is solidified by applying the solution for binder layer 107 to the diffusion zone 105, and calcinating the applied binder layer 106,107.

[0005]Next, while applying the solution of the negative electrode layer 101 to the solidified binder layer 106, negative and the positive electrode layer 101,102 are solidified by applying the solution of the positive electrode layer 102 to the solidified binder layer 107, and drying applied negative and the positive electrode layer 101,102. Subsequently, the diffusion zone 105 by which the positive electrode layer 102 was continuously carried the sheet shaped ion-exchange membrane 103 and solidified to the solidified negative electrode layer 101 by the ion-exchange membrane 103 is carried, and the multilayer structure of seven layers is formed. Next, electrode structure is formed by carrying out heat crimping of this multilayer structure like an arrow.
[0006]
[Problem(s) to be Solved by the Invention]Since heat crimping of the electrode structure is carried out where it was using the sheet as the ion-exchange membrane 103 and each layer of the binder layer 106, the negative electrode layer 101, the positive electrode layer 102, and the binder layer 107 is solidified in addition as mentioned above, a possibility that an adhesion defective part may occur is on the boundary of each layer. If an adhesion defective part occurs on each class of electrode structure, it becomes difficult to generate current efficiently, in the stage of an inspection of a production line, such electrode structures become disposal and restoration disposal, and that has become the hindrance which improves productivity.
[0007]Since the sheet is used as the ion-exchange membrane 103 of electrode structure, about electrode structure, in the case of heat crimping, the ion-exchange membrane 103 will be pressurized by a heated state, and there is a possibility that the performance of the ion-exchange membrane 103 may fall. The parts which are the targets of disposal or restoration disposal in the stage of an inspection increase further by this, and that has become the hindrance which improves productivity.
[0008]In addition, since the sheet is used as the ion-exchange membrane 103, if the handling nature of the ion-exchange membrane 103 is taken into consideration, it is necessary to make the ion-exchange membrane 103 to some extent thick. For this reason, it is difficult to make electrode structure thin, and that becomes the hindrance which attains the miniaturization of electrode structure.
[0009]Then, the purpose of this invention can prevent an adhesion defective part occurring on the boundary of each layer, can prevent the degradation of an ion-exchange membrane further, and there is in providing the manufacturing method of the electrode structure for fuel

cells which can make an ion-exchange membrane thin in addition.

[0010]

[Means for Solving the Problem]The following solution was applied, and this solution did not sink into a previous coat, but that an adhesion defective part generates this invention persons between each layer traced that it was that cause that poor adhesion occurs as a result, after a previous coat solidified. Then, before a previous coat got dry, when the following solution was piled up, it turned out that a solution sinks into a previous coat and adhesion increases remarkably. Similarly, when a solution was applied to a sheet shaped ion-exchange membrane, a solution did not sink into a sheet shaped ion-exchange membrane, but that poor adhesion occurs as a result traced that it was the cause.

[0011]Then, a process of claim 1 applying on a sheet a solution for electrodes of either one of right and a negative electrode which constitutes a fuel cell, and forming one electrode layer, A process of applying a solution for ion-exchange membranes on electrode layer of one of these, and forming an ion-exchange membrane in inside in which electrode layer of one of these is not dried, A process solidified by drying a process at which this ion-exchange membrane applies a solution for electrodes of another side, and forms an electrode layer of another side on this ion-exchange membrane in undried inside, these one electrode layer, an electrode layer of another side, and an ion-exchange membrane, and a manufacturing method of electrode structure for ** fuel cells were constituted.

[0012]If a solution is adopted as an ion-exchange membrane and a solution for electrodes and a solution for ion-exchange membranes are applied in the state of un-drying, respectively, mixing will occur on a boundary. Since it can prevent an adhesion defective part occurring on a boundary of an electrode of a couple, and each class of an ion-exchange membrane by this, reaction efficiency in an ion-exchange membrane can be kept good.

[0013]Here, when a sheet is used for an ion-exchange membrane, in order to keep suitable the handling nature of a sheet-shaped ion-exchange membrane, it is necessary to make an ion-exchange membrane to some extent thick. For this reason, it is difficult to make electrode structure thin, and that becomes the hindrance which attains a miniaturization of electrode structure.

[0014]Then, an ion-exchange membrane is used as a solution in claim 1, and it enabled it to handle an ion-exchange membrane in the state of a solution. It is not necessary to regulate thickness of an ion-exchange membrane by using an ion-exchange membrane as a solution in the case of handling. For this reason, it becomes possible to make an ion-exchange membrane thin, and electrode structure can be made thin.

[0015]Claim 2 performs desiccation, without applying load. A solution for electrodes and a solution for ion-exchange membranes are applied in the state of un-drying, respectively, and it dries without applying load after applying each solution. Thereby, since it is not necessary to

apply load to an ion-exchange membrane, load can prevent performance of an ion-exchange membrane falling.

[0016]A process of claim 3 applying a solution for negative electrodes which constitutes a fuel cell on the sheet shaped negative-electrode side diffusion zone, and forming a negative electrode layer, A process of applying a solution for ion-exchange membranes on this negative electrode layer, and forming an ion-exchange membrane in inside in which this negative electrode layer is not dried, A process of applying a solution for anodes on this ion-exchange membrane, and forming a positive electrode layer in inside in which this ion-exchange membrane is not dried, A manufacturing method of electrode structure for fuel cells consisted of a process of providing the anode side diffusion zone in inside which is not dried [of this positive electrode layer] on this positive electrode layer, and a solidifying process solidified by drying each solution of negative [these], a positive electrode layer, and an ion-exchange membrane.

[0017]An ion-exchange membrane can be handled in the state of a solution by using an ion-exchange membrane as a solution like claim 1. It is not necessary to regulate thickness of an ion-exchange membrane by using an ion-exchange membrane as a solution in the case of handling. For this reason, it becomes possible to make an ion-exchange membrane thin, and electrode structure can be made thin.

[0018]Here, a hydrogen content child (H_2) and an oxygen molecule (O_2) generate produced water (H_2O) in a fuel cell in response to the time of generating current using a fuel cell. This produced water makes the anode side diffusion zone (carbon paper) mainly penetrate, and is discharged to the exterior of a fuel cell. However, as claim 1 indicated, when a solution for ion-exchange membranes is applied on an undried electrode layer, there is a possibility of a solution for ion-exchange membranes flowing caudad under influence of gravity, and permeating an electrode layer. When a solution for ion-exchange membranes permeates an electrode layer, there is a possibility that openings of an electrode layer may decrease in number with a solution which permeated.

[0019]For this reason, if a positive electrode layer of the right and negative electrode layers is arranged under the ion-exchange membrane when manufacturing electrode structure for fuel cells, We are anxious about the ability not to discharge efficiently produced water which openings of a positive electrode layer decreased in number with a solution for ion-exchange membranes, and generated by power generation from the anode side diffusion zone to the exterior of a fuel cell.

[0020]Since supplying reactant gas of hydrogen or oxygen suitably will be barred if produced water cannot be discharged efficiently, concentration overvoltage becomes high and it becomes difficult to keep power generation performance of a fuel cell good. Supply of reacting matter in an electrode and a resultant and speed of "concentration overvoltage" of removal are

slow, and it means sag which appears when a reaction of an electrode is blocked. That is, I hear that the amount of sag of become [concentration overvoltage / high] increases, and there is.

[0021]Then, in claim 3, a positive electrode layer was provided above an ion-exchange membrane. By arranging a positive electrode layer above an ion-exchange membrane, it can prevent a solution for ion-exchange membranes permeating a negative electrode layer under influence of gravity, and openings of a positive electrode layer can be prevented from decreasing in number with a solution for ion-exchange membranes. Produced water generated by power generation can be led to the anode side diffusion zone from a positive electrode layer by this, it can discharge suitably from an opening of the anode side diffusion zone, and concentration overvoltage produced in a fuel cell can be stopped low.

[0022]Claim 4 applies a solution for anodes by a spray state. Here, when coating pressure of a solution for anodes is high and a solution for anodes is applied, there is a possibility that a solution for ion-exchange membranes may permeate a positive electrode layer. When a solution for ion-exchange membranes permeates a positive electrode layer, a solution for ion-exchange membranes reaches the anode side diffusion zone, and there is a possibility that openings of the anode side diffusion zone may decrease in number with a solution for ion-exchange membranes.

[0023]Then, in claim 4, it decided to apply a solution for anodes with the minimum coating pressure, without applying excessive coating pressure to an ion-exchange membrane by applying a solution for anodes by a spray state. Thus, it can prevent a solution for ion-exchange membranes permeating a positive electrode layer by applying a solution for anodes without applying excessive coating pressure to an ion-exchange membrane.

[0024]Therefore, openings of a positive electrode layer can be prevented from decreasing in number with a solution for ion-exchange membranes, and an opening of a positive electrode layer can be secured much more suitably. Produced water generated by power generation can be led from a positive electrode layer to an anode diffusion zone by this, it can discharge much more suitably from an opening of the anode side diffusion zone, and concentration overvoltage produced in a fuel cell can be stopped low.

[0025]

[Embodiment of the Invention]An embodiment of the invention is described below based on an attached drawing. Drawing 1 is an exploded perspective view showing the fuel cell provided with the electrode structure (a 1st embodiment) concerning this invention. The fuel cell unit 10 consists of the fuel cells 11 and 11 of plurality (two pieces). The fuel cell 11 arranges the negative-electrode side stream way board 31 on the outside of the negative-electrode side diffusion zone (sheet) 13 which constitutes the electrode structure 12 for fuel cells (electrode structure), and arranges the anode side stream way board 34 on the outside of the anode side

diffusion zone 14 which constitutes the electrode structure 12.
[0026]In laminating the negative-electrode side stream way board 31 to the negative-electrode side diffusion zone 13, the hydrogen gas channel 32 is formed by covering the passage groove 31a of the negative-electrode side stream way board 31 by the negative-electrode side diffusion zone 13. The oxygen gas channel 35 is formed by covering the passage groove 34a of the anode side stream way board 34 by the anode side diffusion zone 14 in laminating the anode side stream way board 34 to the anode side diffusion zone 14.
[0027]The electrode structure 12 is provided with the positive electrode layer 18 as the negative electrode layer 17 as one electrode layer, and an electrode layer of another side via a binder, respectively inside the negative-electrode side diffusion zone 13 and the anode side diffusion zone 14, and is provided with the ion-exchange membrane 19 between these negative electrode layers 17 and the positive electrode layer 18. Thus, the fuel cell unit 10 consists of having two or more (drawing 1 shows only two pieces) constituted fuel cells 11 via the separator 36. Drawing 2 explains the electrode structure 12 in detail.
[0028]While making a hydrogen content child (H_2) stick to the catalyst included in the negative electrode layer 17 by supplying hydrogen gas to the hydrogen gas channel 32 according to the fuel cell unit 10, an oxygen molecule (O_2) is made to stick to the catalyst included in the anode 18 by supplying oxygen gas to the oxygen gas channel 35. Thereby, an electron (e^-) can be poured like an arrow and current can be generated.When generating current, it is generated by produced water (H_2O) from a hydrogen content child (H_2) and an oxygen molecule (O_2).
[0029]Drawing 2 is an explanatory view showing the electrode structure for fuel cells concerning this invention (a 1st embodiment). The electrode structure 12 is provided with the negative electrode layer 17 and the positive electrode layer 18, respectively inside the negative-electrode side diffusion zone 13 and the anode side diffusion zone 14, and is provided with the ion-exchange membrane 19 between these negative electrode layers 17 and the positive electrode layer 18. The negative-electrode side diffusion zone 13 is a web material (sheet) which consists of the carbon paper 13a by the side of a negative electrode, and the binder layer 15a by the side of a negative electrode. The anode side diffusion zone 14 is a web material (sheet) which consists of the carbon paper 14a by the side of an anode, and the binder layer 16a by the side of an anode.
[0030]The binder which constitutes the binder layer 15a by the side of a negative electrode is a carbon fluoro-resin, and is excellent in water repellence. The binder which constitutes the binder layer 16a by the side of an anode is carbon polymer provided with water repellence, and that to which carbon polymer introduced sulfonic acid into the skeleton of polytetrafluoroethylene corresponds.
[0031]The negative electrode layer 17 mixes the catalyst 21 in the solution for negative

electrodes, and solidifies it by drying, after applying a solution. The catalyst 21 of the negative electrode layer 17 supports 23 as a catalyst (platinum-ruthenium alloy) on the surface of the carbon 22, and makes a hydrogen content child (H_2) stick to 23 (platinum-ruthenium alloy).

[0032]The positive electrode layer 18 mixes the catalyst 24 in the solution for anodes, and solidifies it by drying, after applying a solution. The catalyst 24 of the positive electrode layer 18 supports the platinum 26 as a catalyst on the surface of the carbon 25, and makes an oxygen molecule (O_2) stick to the platinum 26. After applying the ion-exchange membrane 19 in the state of a solution between the negative electrode layer 17 and the positive electrode layer 18, it is solidified by drying together with the solution of a negative electrode, and the solution of an anode to the negative electrode layer 17 and the positive electrode layer 18, and one.

[0033]Next, the manufacturing method of the electrode structure 12 is explained based on drawing 3 - drawing 5. Drawing 3 (a) - (c) is the 1st routing description figure showing the manufacturing method (a 1st embodiment) of the electrode structure for fuel cells concerning this invention. In (a), the sheet shaped negative-electrode side diffusion zone 13 is arranged. That is, after setting the carbon paper 13a of the negative-electrode side diffusion zone 13, the solution for the binder layers 15a is applied on this carbon paper 13a.

[0034]In (b), the binder layer 15a applies the solution for negative electrodes on the binder layer 15a, and forms the negative electrode layer 17 in undried inside. In (c), the negative electrode layer 17 applies the solution for ion-exchange membrane 19 on the negative electrode layer 17, and forms the ion-exchange membrane 19 in undried inside.

[0035]Drawing 4 (a) and (b) is the 2nd routing description figure showing the manufacturing method (a 1st embodiment) of the electrode structure for fuel cells concerning this invention. In (a), the ion-exchange membrane 19 applies the solution for positive electrode layer 18 on the ion-exchange membrane 19, and forms the positive electrode layer 18 in undried inside. In (b), the positive electrode layer 18 applies to undried inside the solution of the binder layer 16a which constitutes the anode side diffusion zone 14 (refer to drawing 2) on the positive electrode layer 18.

[0036]Drawing 5 (a) and (b) is the 3rd routing description figure showing the manufacturing method (a 1st embodiment) of the electrode structure for fuel cells concerning this invention. In (a), the sheet shaped anode side diffusion zone 14 is formed with the binder layer 16a and the carbon paper 14a by putting the carbon paper 14a by the side of an anode on the binder layer 16a.

[0037]Next, each layers 15a, 17, 18, and 16a and film 19 are dried together without the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a applying load to each layers 15a, 17, 18, and 16a and film 19 in undried inside.

[0038]In (b), where the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a are solidified by solidifying the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a, it laminates. Thereby, the manufacturing process of the electrode structure 12 of a 1st embodiment is completed.
[0039]Thus, according to a 1st embodiment, the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a can mix suitably the solutions which adjoin each upper surface on each boundary by applying a solution in the state of un-drying.
[0040]Therefore, it can prevent an adhesion defective part occurring on the boundary between the binder layer 15a and the negative electrode layer 17. It can prevent an adhesion defective part occurring on the boundary between the negative electrode layer 17 and the ion-exchange membrane 19. It can prevent an adhesion defective part occurring on the boundary between the ion-exchange membrane 19 and the positive electrode layer 18. In addition, it can prevent an adhesion defective part occurring on the boundary between the positive electrode layer 18 and the binder layer 16a. Thereby, the reaction efficiency in the electrode structure 12 can be kept good.
[0041]It dries without the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a applying each solution, and applying load in the state of un-drying after applying each solution. Since it is not necessary to apply load to the ion-exchange membrane 19 by this when solidifying the ion-exchange membrane 19, it can prevent the performance of the ion-exchange membrane 19 falling under the influence of load.
[0042]In addition, since the ion-exchange membrane 19 can be handled in the state of a solution by using the ion-exchange membrane 19 as a solution, it is not necessary to regulate the thickness of the ion-exchange membrane 19 from a viewpoint of handling nature. For this reason, it becomes possible to make the ion-exchange membrane 19 thin, and electrode structure 12 can be made thin.
[0043]Next, a 2nd embodiment explains more concretely the manufacturing method of the electrode structure for fuel cells. Identical codes are attached about the same member as a 1st embodiment, and explanation is omitted. Drawing 6 (a) - (c) is the 1st routing description figure showing the manufacturing method (a 2nd embodiment) of the electrode structure for fuel cells concerning this invention. In (a), the sheet shaped negative-electrode side diffusion zone 13 is arranged. That is, after setting the carbon paper 13a of the negative-electrode side diffusion zone 13, the solution for the binder layers 15a is applied on this carbon paper 13a.
[0044]By injecting the solution for negative electrode layer 17 from the injection tip 56 to spray form in (b), while the binder layer 15a moves the spray 55 to undried inside like an arrow over

the upper surface of the binder layer 15a, On the binder layer 15a, the solution for negative electrode layer 17 is applied, and the negative electrode layer 17 is formed.
[0045]In (c), while the negative electrode layer 17 moves the coating machine 57 to undried inside like an arrow over the upper surface of the negative electrode layer 17, on the negative electrode layer 17, the solution for ion-exchange membrane 19 is applied, and the ion-exchange membrane 19 is formed. Isolating the braid 57a of the coating machine 57 from the upper surface of the negative electrode layer 17 between predetermined to the upper part, specifically arranging in parallel with the upper surface, and moving this braid 57a like an arrow over the upper surface of the negative electrode layer 17. The ion-exchange membrane 19 is formed by accustoming the paste (solution) of the ion-exchange membrane 19 to fixed thickness with the braid 57a.
[0046]By applying the solution for ion-exchange membrane 19 on the negative electrode layer 17, the solution for ion-exchange membrane 19 flows caudad like an arrow under the influence of gravity, and there is a possibility of permeating the negative electrode layer 17. Although there is a possibility that the openings of the negative electrode layer 17 may decrease in number, by this, even if the openings of the negative electrode layer 17 decrease in number to some extent, there is no possibility of affecting the performance of a fuel cell.
[0047]Drawing 7 (a) and (b) is the 2nd routing description figure showing the manufacturing method (a 2nd embodiment) of the electrode structure for fuel cells concerning this invention. In (a), while the ion-exchange membrane 19 moves the spray 58 to undried inside like an arrow over the upper surface of the ion-exchange membrane 19, by injecting the solution for positive electrode layer 18 from the injection tip 59 to spray form, the solution for positive electrode layer 18 is applied, and the positive electrode layer 18 is formed on the ion-exchange membrane 19. The reason for having applied the solution for positive electrode layer 18 to the upper surface of the ion-exchange membrane 19 using the spray 58 is mentioned later.
[0048]In (b), the positive electrode layer 18 applies the solution of the binder layer 16a which constitutes the anode side diffusion zone 14 (refer to drawing 2) on the positive electrode layer 18, and forms the binder layer 16a in undried inside.
[0049]Next, the sheet shaped anode side diffusion zone 14 is formed with the binder layer 16a and the carbon paper 14a like drawing 5 (a) by putting the carbon paper 14a by the side of an anode on the binder layer 16a. Next, each layers 15a, 17, 18, and 16a and film 19 are dried together without the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a applying load to each layers 15a, 17, 18, and 16a and film 19 in undried inside.
[0050]Subsequently, where the binder layer 15a, the negative electrode layer 17, the ion-exchange membrane 19, the positive electrode layer 18, and the binder layer 16a are solidified like drawing 5 (b) by solidifying the binder layer 15a, the negative electrode layer 17, the ion-

exchange membrane 19, the positive electrode layer 18, and the binder layer 16a, it laminates to one. Thereby, the manufacturing process of a 2nd embodiment is completed.

[0051]According to a 2nd embodiment, the same effect as a 1st embodiment can be acquired. According to a 1st and 2nd embodiment, the positive electrode layer 18 can be arranged above the ion-exchange membrane 19 by forming the positive electrode layer 18 above the ion-exchange membrane 19. Therefore, the solution for ion-exchange membrane 19 can prevent permeating the positive electrode layer 18, and can prevent the openings of the positive electrode layer 18 from decreasing in number with the solution for ion-exchange membrane 19.

[0052]Since the produced water generated by power generation can be led to the anode side diffusion zone 14 through the opening of the positive electrode layer 18 and can be suitably discharged from the anode side diffusion zone 14 by this, the concentration overvoltage produced in a fuel cell can be stopped low.

[0053]In addition, the solution for positive electrode layer 18 can be applied with the minimum coating pressure, without according to a 2nd embodiment, applying excessive coating pressure to the ion-exchange membrane 19 or the positive electrode layer 18 by applying the solution for positive electrode layer 18 with a spray method, when forming the positive electrode layer 18. Thus, it can prevent the solution for ion-exchange membrane 19 permeating the positive electrode layer 18 by applying the solution for positive electrode layer 18 without applying excessive coating pressure to the ion-exchange membrane 19 or the positive electrode layer 18.

[0054]Therefore, it can prevent the openings of the positive electrode layer 18 decreasing in number with the solution for ion-exchange membrane 19, and the opening of the positive electrode layer 18 can be secured much more suitably. Since the produced water generated by power generation can be led to the anode side diffusion zone 14 through the opening of the positive electrode layer 18 and can be discharged much more suitably from the opening of the anode side diffusion zone 14 by this, the concentration overvoltage produced in a fuel cell can be stopped low.

[0055]At said 2nd embodiment, although the solution for positive electrode layer 18 was applied to the upper surface of the ion-exchange membrane 19 using the spray 58, the spreading of the solution for positive electrode layer 18 can also adopt an inkjet method without restricting to the spray 58. In short, what is necessary is just a method which can apply the solution for positive electrode layer 18 to spray form.

[0056]Here, the spray and the ink jet are the same at the point which applies a solution to spray form. Although a spraying range is comparatively wide and the spray can shorten application time, a masked work is needed in order to secure a non-application portion. Generally, recovery is difficult for the solution adhering to a masked work part.

[0057]On the other hand, since the ink jet can narrow down an application range correctly, it does not need to perform a masked work to a non-application portion, and can use a solution effectively. However, since the application range is narrow, as compared with a spray, spreading speed is inferior in an ink jet.

[0058]Although said 2nd embodiment explained the example which uses the spray 55 for the upper surface of the binder layer 15a by the side of a negative electrode, and applies the solution for negative electrode layer 17, it is also possible to apply the solution for negative electrode layer 17 by other application means. Although said 2nd embodiment explained the example which uses the coating machine 57 for the upper surface of the negative electrode layer 17, and applies the solution for ion-exchange membrane 19, it is also possible to apply the solution for ion-exchange membrane 19 by other application means.

[0059]By said 1st and 2nd embodiment, when manufacturing the electrode structure 12 for fuel cells, the example which has arranged the negative electrode layer 17 caudad and has arranged the positive electrode layer 18 up was explained, but it is also possible to arrange the positive electrode layer 18 caudad and to arrange the negative electrode layer 17 up without restricting to this.

[0060]

[Effect of the Invention]This invention demonstrates the following effect by the above-mentioned composition. If claim 1 adopts a solution as an ion-exchange membrane and the solution for electrodes and the solution for ion-exchange membranes are applied in the state of un-drying, respectively, mixing will generate it on a boundary. Since it can prevent an adhesion defective part occurring on the boundary of the electrode of a couple, and each class of an ion-exchange membrane by this, the reaction efficiency in an ion-exchange membrane can be kept good. As a result, since the quality of electrode structure can be stabilized, productivity can be improved.

[0061]In addition, since an ion-exchange membrane can be handled in the state of a solution by using an ion-exchange membrane as a solution, it is not necessary to regulate the thickness of an ion-exchange membrane from a viewpoint of handling nature. For this reason, since it becomes possible to make an ion-exchange membrane thin and electrode structure can be made thin, the miniaturization of electrode structure can be attained.

[0062]Claim 2 applies the solution for electrodes, and the solution for ion-exchange membranes in the state of un-drying, respectively, and it dries them without applying load after applying each solution. Thereby, since it is not necessary to apply load to an ion-exchange membrane, load can prevent the performance of an ion-exchange membrane falling. Therefore, since the quality of electrode structure can be stabilized, improvement in productivity can be aimed at.

[0063]Like claim 1, claim 3 is using an ion-exchange membrane as a solution, and can handle

an ion-exchange membrane in the state of a solution. It is not necessary to regulate the thickness of an ion-exchange membrane by using an ion-exchange membrane as a solution in the case of handling. For this reason, it becomes possible to make an ion-exchange membrane thin, and electrode structure can be made thin.

[0064]Claim 3 can prevent the solution for ion-exchange membranes permeating a positive electrode layer under the influence of gravity by providing a positive electrode layer above an ion-exchange membrane, and can prevent the openings of a positive electrode layer from decreasing in number with the solution for ion-exchange membranes. Therefore, the produced water generated by power generation can be led to the anode side diffusion zone from a positive electrode layer, it can discharge suitably from the opening of the anode side diffusion zone, the concentration overvoltage produced in a fuel cell can be stopped low, and the power generation performance of a fuel cell can be kept good.

[0065]Claim 4 was applying the solution for anodes by a spray state, and it was made to apply the solution for anodes with the minimum coating pressure, without applying excessive coating pressure to an ion-exchange membrane. Thus, it can prevent the solution for ion-exchange membranes permeating a positive electrode layer by applying the solution for anodes without applying excessive coating pressure to an ion-exchange membrane.

[0066]Therefore, the openings of a positive electrode layer can be prevented from decreasing in number with the solution for ion-exchange membranes, and the opening of a positive electrode layer can be secured much more suitably. Therefore, the produced water generated by power generation is led from a positive electrode layer to an anode diffusion zone, from the opening of the anode side diffusion zone, it can discharge much more suitably, the concentration overvoltage produced in a fuel cell can be stopped low, and the power generation performance of a fuel cell can be further maintained at fitness.

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1]A manufacturing method of electrode structure for fuel cells characterized by comprising the following.
A process of applying a solution for electrodes of either one of right and a negative electrode which constitutes a fuel cell, and forming one electrode layer on a sheet.
A process of applying a solution for ion-exchange membranes on electrode layer of one of these, and forming an ion-exchange membrane in inside in which electrode layer of one of these is not dried, A process solidified by drying a process at which this ion-exchange membrane applies a solution for electrodes of another side, and forms an electrode layer of another side on this ion-exchange membrane in undried inside, these one electrode layer, an electrode layer of another side, and an ion-exchange membrane.

[Claim 2]A manufacturing method of the electrode structure for fuel cells according to claim 1 performing said desiccation without applying load.
[Claim 3]A manufacturing method of electrode structure for fuel cells characterized by comprising the following.
A process of applying a solution for negative electrodes which constitutes a fuel cell, and forming a negative electrode layer on the sheet shaped negative-electrode side diffusion zone.
A process of applying a solution for ion-exchange membranes on this negative electrode layer, and forming an ion-exchange membrane in inside in which this negative electrode layer is not dried, A process of applying a solution for anodes on this ion-exchange membrane, and forming a positive electrode layer in inside in which this ion-exchange membrane is not dried, A process of providing the anode side diffusion zone in inside which is not dried [of this positive electrode layer] on this positive electrode layer, and a solidifying process solidified by drying each solution of negative [these], a positive electrode layer, and an ion-exchange

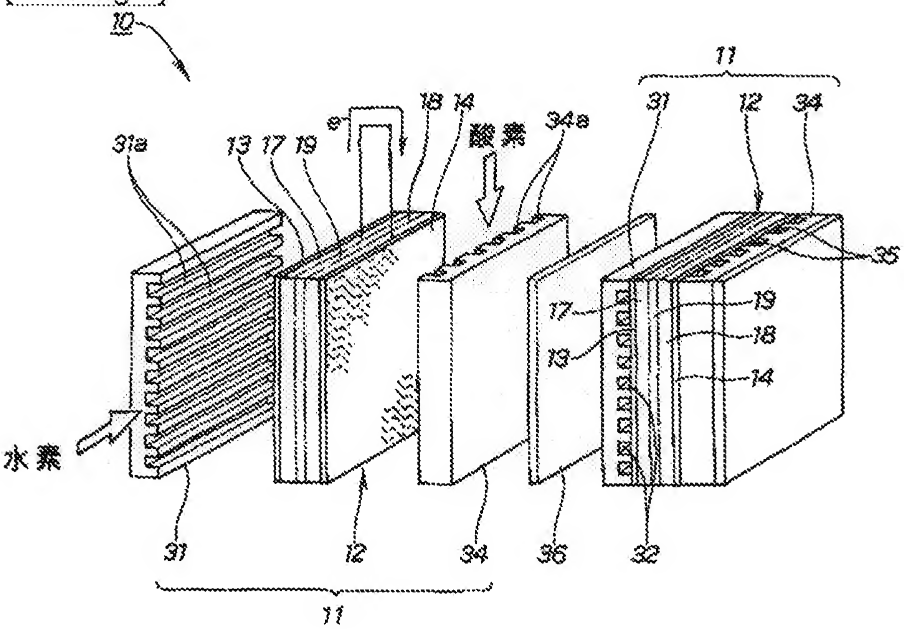
membrane.

[Claim 4]A manufacturing method of the electrode structure for fuel cells according to claim 4 applying a solution for said anodes by a spray state.

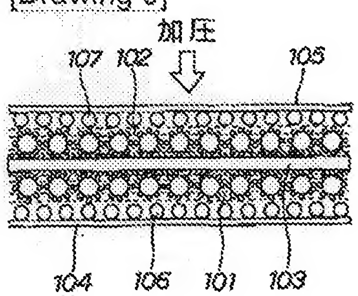
[Translation done.]

DRAWINGS

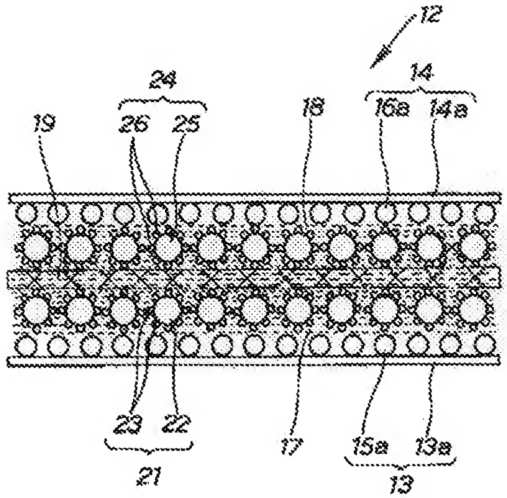
[Drawing 1]



[Drawing 9]

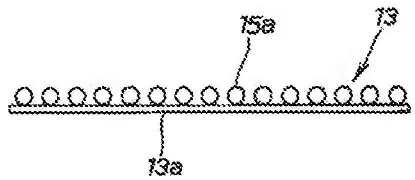


[Drawing 2]

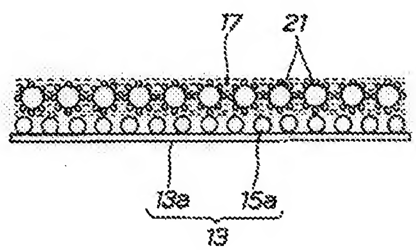


[Drawing 3]

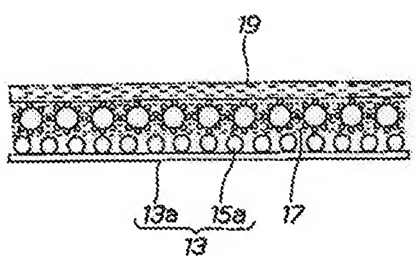
(a)



(b)

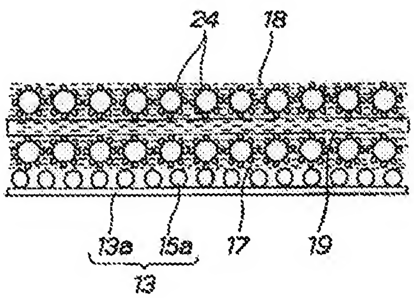


(c)



[Drawing 4]

(a)



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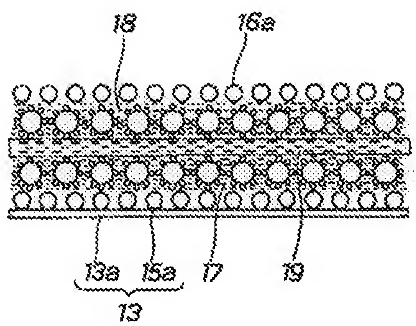
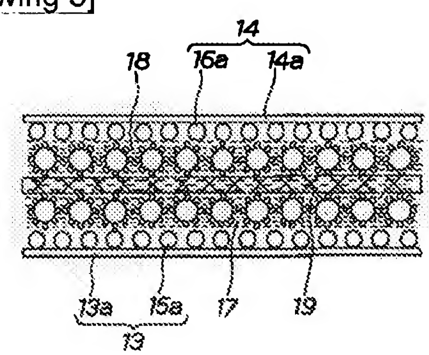


[Drawing 5]

(a)



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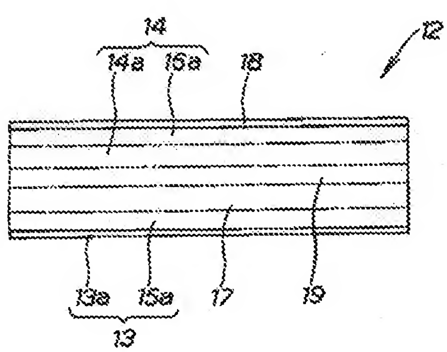
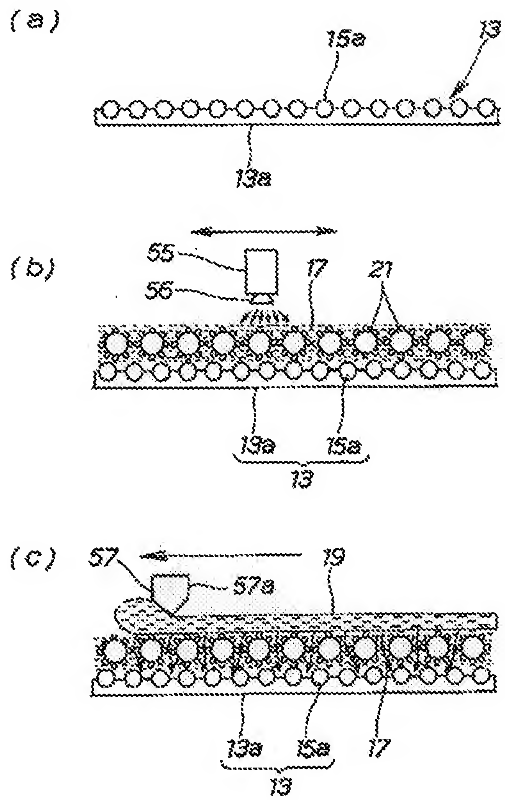
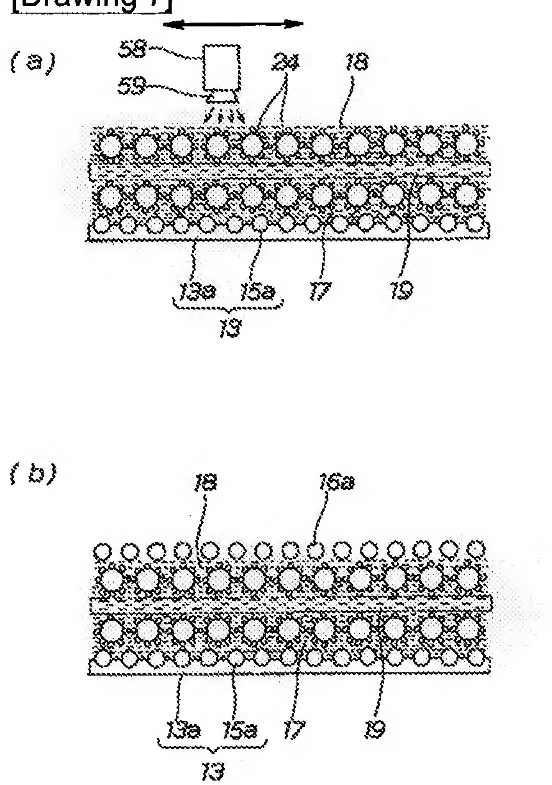


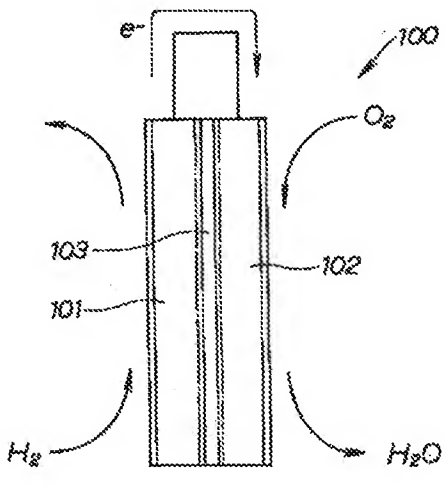
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]